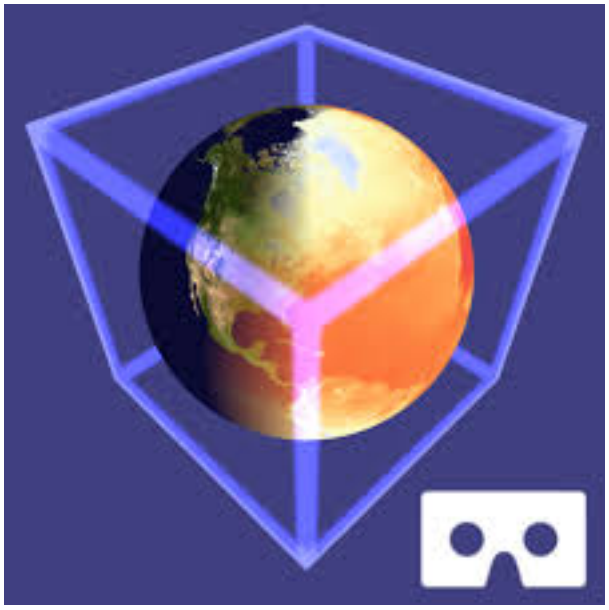
My NASA Data - Lesson Plans

HoloGLOBE with MERGE Cube



Purpose

Explore NASA satellite data using the MERGE Cube and the HoloGLOBE app to visualize our dynamic planet by looking at aerosols and cloud cover! This app was developed by the Institute for Earth Observations at Palmyra Cove, through GLOBE Mission Earth.

Learning Objectives

Students will be able to:

- Use technology (HoloGLOBE) to evaluate the change of Earth Systems over time

- Identify the factors that NASA satellites monitor on Earth Develop or evaluate technology that can minimize the influence of human impacts on Earth Systems

Essential Questions

- How can we evaluate Earth Systems over time?
- What factors influence how Earth Systems change over time?
- How can technology be used to minimize the effects of human impacts on Earth Systems?

Materials Required

- HoloGLOBE App (See in Related Resources)
- MERGE Cube (paper or plastic version)
- Digital Device (smart phone or tablet)
- Laptop Computer with access to My NASA Data's Earth System Data Explorer
- HoloGLOBE Lesson Page
- Earth System Data Explorer Video Tutorials and Instructional Guide (Optional)

Technology Requirements

- Internet Required
- Visualization Tool Required

Procedure

Getting Started:

1. Download the app on your device. See the *Related Resources* for links.
2. Print off the MERGE cube.

Anticipatory Set:

1. Ask Students: What type of factors may influence Earth Systems?
   time of year, human population and activities, energy flow, land and sea temperature, precipitation, etc....
2. Ask Students: How do we study earth to determine if it is changing at all?
   NASA satellites, aircraft, field research stations, and computer simulations based on real data....
3. Tell students:
   Today we are going to look at NASA real-time data and technologies to understand a little bit more about earth systems using a HoloGLOBE – an augmented reality program and device called a Merge Cube.

Day 1 Introduction:

1. Turn on your mobile device and open up the HoloGLOBE app. Position the Merge Cube on the cube case stand and your mobile device on the device stand. (You can also hold both if you prefer.) Point the device camera at the merge cube and you should see a globe appear.
2. Click on the green “+” on the left side of your screen.
3. Click the GLOBE icon  on the right of the screen and watch the short video. Answer these 5 questions when the video is done. (Read the questions before you begin the video.)
4. See the questions on the handout and answer them.

Day 2 Activity 1: Aerosols

1. Define aerosols and give examples of natural and manmade aerosols.
2. Click on the NASA icon  on the right side of the screen. A message appears about the data.
    - It says: “This models provides data....” READ THIS MESSAGE. As you observe the data, look for patterns within each map and factors that could influence these patterns.
3. Now click on the light blue “ → ” on the right. A message appears about the data you are seeing. It says: “AOT, also called.....” READ THIS MESSAGE, and answer the question on your worksheet. Notice that behind the message each month of the year appears every second and a pink and white image of the Earth are associated with each month.
4. To get rid of the message and see the pink and white data, click the green “-“ on the left.
5. Now click on the green “+” on the left and you should see the rotating pink and white data images with the month at the top of the globe.
6. Reposition your Merge Cube so you are looking at North America and answer the questions for this activity.

Day 2 Activity 2: Cloud Coverage

1. Click on the NASA icon  on the right side of the screen. A message appears about the data. It says: “This models provides data....” READ THIS MESSAGE. As you observe the data, look for patterns within each map and factors that could influence these patterns.
2. Now click on the light blue “ → ” TWICE on the right. A message appears about the data you are seeing. It says: “Cloud coverage is the percent.....” READ THIS MESSAGE, and answer the question on your worksheet. Notice that behind the message each month of the year appears every second and a blue and white image of the Earth are associated with each month.
3. To get rid of the message and see the blue and white data, click the green “-“ on the left
4. Now click on the green “+” on the left and you should see the rotating blue and white data

images with the month at the top of the globe.
5. Reposition your Merge Cube so you are looking at North America and answer the questions for this activity.
6. Repeat this process for Insolation (solar radiation), Precipitation (total rainfall), Surface Skin Temperature (land and sea surface temperatures), and Green Up/Green Down (Chlorophyll concentrations and vegetation)

Day 3 Activity 1: NASA Satellites

Now, let's visualize other kinds of data using HoloGLOBE and the Merge Cube by beginning with land cover and then selecting a dataset of interest.

1. Take students to the My NASA Data website and link to the Earth Systems Data Explorer (also known as the LAS, Live Access Server). Show students the tutorial video on how to manipulate the information in the Earth Systems Data Explorer.
2. Now have students click on Data Set in the upper left and click on the Geosphere/All Data/ Land Cover Classification/ Grasslands.
3. Under Date and Time, identify September 2015, 2016 or 2017.
4. Have students choose one geographic location that is a continent.
5. Have the students export the image of the continent they see using the “print” feature of the Earth Systems Data Explorer. Option: you may choose to have students look at other Earth Systems Data Explorer features related to:

- Drought Risk
- Snow and Ice
- Earthquake
- Clouds
- Land Surface Temperature
- Precipitation
- Sea Surface Temperature

Grade Band

- 3-5
- 6-8
- 9-12

Lesson Duration

- 90 minutes

Supported NGSS Performance Expectations

- 4-ESS2-2: Analyze and interpret data from maps to describe patterns of Earth's features.
- 5-ESS2-1: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- MS-PS3-3: Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
- HS-ESS3-4: Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

NGSS Disciplinary Core Ideas

- PS3B: Conservation of Energy and Energy Transfer
- ESS3C: Human Impacts on Earth Systems

NGSS Science and Engineering Practices

- Developing and Using Models

Related Resources

- HoloGLOBE in the IOS App Store - This app is available only on the App Store …
- HoloGLOBE - Apps on Google Play
- Earth System Data Explorer - Instructional Guide
- Earth System Data Explorer - Video Tutorials

Instructional Strategies

- Discovery/Inquiry-based instruction